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U. S. Department of Labor
Occupational Safety and Health Administration
Directorate of Science, Technology and Medicine
Office of Science and Technology Assessment

Potential for Occupational Exposure to Lyme Disease

Safety and Health Information Bulletins

SHIB 02-11

MEMORANDUM FOR: REGIONAL ADMINISTRATORS
THROUGH: R. DAVIS LAYNE
Deputy Assistant Secretary
FROM: RUTH MCCULLY
Director
Directorate of Science, Technology and Medicine
SUBJECT: SAFETY AND HEALTH INFORMATION BULLETIN:
Exposure to Lyme Disease

The Occupational Safety and Health Administration's Directorate of Science, Technology, and Medicine issues Safety and Health Information Bulletins (SHIBs) to provide information about occupational hazards and/or to provide information about noteworthy, innovative, or specialized procedures, practices, and research that relate to occupational safety and health. These bulletins are not standards or regulations and they create no independent legal obligations. They are advisory in nature, informational in content, and are intended to assist employers in providing a safe and healthful workplace. Further information about this bulletin may be obtained by contacting OSHA's Directorate of Science, Technology, and Medicine at 202-693-2300.

Purpose

This bulletin provides guidance for workers and employers about how to decrease the risk of Lyme disease in individuals who may be potentially exposed on the job to Lyme disease-causing ticks. OSHA has received inquiries on occupational exposure to Lyme disease-causing ticks for individuals who work outdoors in heavily wooded or grassy areas. These workers include those with certain construction and forestry duties as well as individuals in other occupations. Concerns have developed because of an increase in the number of reported cases of Lyme disease since 1982 and heightened awareness regarding possible long-term health effects resulting from untreated infection. If recognized early, Lyme disease can be easily treated with antibiotic medication. However, if the disease goes unrecognized and untreated, chronic conditions may ensue, including varying degrees of permanent damage to the joints or the nervous system (1). The Centers for Disease Control and Prevention (CDC) has published several guidelines on the prevention of Lyme disease, including avoiding or clearing tick-infested habitat; using personal protective measures, such as clothing and repellent; performing tick checks; and removing ticks early. (See CDC website at www.cdc.gov). When followed, these guidelines should minimize the risk of infection and reduce the number of cases that may develop. The strategies for preventing tick bites are described by the CDC as the first line of defense against Lyme disease and other tick-borne illnesses. Preventing tick bites also prevents other tick-borne diseases, including babesiosis, ehrlichiosis, tularemia, and Rocky Mountain spotted fever.

Background

Lyme Disease is a multi system, multistage, inflammatory illness caused by *Borrelia burgdorferi*, a corkscrew-shaped bacterium. The disease is transmitted to humans by blood-feeding ticks infected with *B. burgdorferi*. The most important vector for the spread of the disease in the northeast United States is the deer tick, *Ixodes scapularis*; on the

West Coast, the western black-legged tick, *Ixodes pacificus*, is the most important vector (1). These ticks are much smaller than common dog and cattle ticks. They can attach to any part of the human body but are especially likely to attach to the more hidden and hairy areas of the body such as the armpits, groin, and scalp (1). *B. burgdorferi* is primarily transmitted to humans by ticks in the nymphal stage of development, but adult ticks can also transmit *B. burgdorferi*. The nymphal stage tick is usually not much larger than the head of a pin and can easily go unnoticed if attached to an individual. These ticks are slow feeders. Transmission of *B. burgdorferi* from an infected tick is unlikely to occur before 36 hours of tick attachment (1), and infected ticks are most likely to transmit infection after approximately 2 or more days of feeding (1).

Lyme Disease currently accounts for more than 95% of all vector-borne diseases reported in the United States (2,3,4). There have been more than 128,000 cases reported since 1982 (2). In 1998, the estimated incidence of Lyme disease was about 6 per 100,000 people in the U.S.; however, there may be considerable under reporting. In addition, incidence rates vary considerably from state to state and even within states and counties. In a few highly endemic counties, incidence rates exceed 100 per 100,000 people. State and local health departments can be consulted for more information regarding risk in particular areas.

The incidence and prevalence of the disease from occupational exposure has not been precisely defined. Several studies, however, have identified outdoor occupational exposure as a risk factor (5,6). The true incidence of occupationally acquired Lyme disease is hard to define because pinpointing the exact circumstances of infection is exceedingly difficult. In fact, the majority of infected persons do not recall being bitten by a tick.

Awareness of Lyme disease and its signs and symptoms is essential for diagnosing the disease. In some cases, the diagnosis is not made because many of the signs and symptoms associated with Lyme disease are similar to those of the flu. Lyme disease often presents with a characteristic "bulls-eye" rash termed erythema migrans. This rash is seen in 60-80% of people who develop the infection; some people may have the disease without the presence of a rash (1). In addition to this rash, other non-specific symptoms may be present, including fever, lymph node swelling, neck stiffness, generalized fatigue, headaches, migrating joint aches, or muscle aches. The diagnosis is primarily based on a history of known exposure and the development of clinical signs and symptoms. Blood testing can provide valuable supportive diagnostic information. Following a diagnosis, Lyme disease, in most cases, can be successfully treated with standard antibiotic regimens (4). It is very important that the infection be diagnosed and treated with appropriate antimicrobial medication as early as possible because untreated Lyme disease may result in symptoms that are severe, chronic, and disabling. These disorders include chronic inflammatory arthritis, chronic muscle pain, heart disease, and/or neurological (brain and peripheral nerves) disorders (1,4). In addition, Lyme disease in a later stage is more difficult to diagnose, and treatment may be more prolonged and costly.

Description of the Hazard

Many activities can place an individual at risk of exposure to ticks infected with the *B. burgdorferi* bacterium. These activities can be occupational or non-occupational. Most *B. burgdorferi* infections occur after residential exposure to infected ticks during property maintenance, recreational, or leisure activity (3). Non-occupational exposures also occur when individuals away from home participate in recreational activities such as hiking, camping, fishing, and hunting. Occupations that require outdoor activity/work in areas where the disease is endemic can place an individual at increased risk of exposure to an infected tick and therefore to Lyme disease. Occupations that may be associated with an increased risk of exposure to infected ticks include construction, landscaping, forestry, brush clearing, land surveying, farming, railroad work, oil field work, utility line work, and park/wildlife management (1,6).

The CDC estimates that the number of annually reported cases of Lyme Disease has increased 33-fold since national surveillance began in 1982 (based on 17,730 cases in 2000 versus 497 cases in 1982). Cases of Lyme disease have been reported in 48 of the 50 states as well as the District of Columbia (3); 25% of states include at least one area with moderate to high risk of tick infection with the *B. burgdorferi* bacterium. The states that include areas with the highest risk are those in the northeast U.S., from Massachusetts to Maryland; the north-central region including Wisconsin and Minnesota; and an area in northern California in the Pacific-coastal region. There is a high prevalence of *B. burgdorferi* in the tick population in these areas and therefore an increased risk of acquiring Lyme disease from a tick bite. The remainder of the states have no or few ticks infected with *B. burgdorferi* and are considered low, minimal, or no risk for Lyme disease.

Several other factors must be considered when determining risk of exposure to *B. burgdorferi*-infected ticks. For example, an individual's daily activities should be taken into consideration. As previously mentioned, certain occupations and leisure activities are likely to put one at risk; other considerations include the frequency, duration, and season of a likely exposure. Although adult ticks also carry *B. burgdorferi* and can be a source for human infection, the majority of Lyme disease cases result from bites by infected nymphs. Ticks in the nymphal stage feed predominately in the late spring and early summer, although this season may be prolonged in some areas, depending on climatic conditions. State and local health departments are good sources of further information regarding a particular geographic area.

Prolonged, frequent exposure to infected tick habitats, especially during the season when nymphal ticks are feeding, significantly increases the risk of being bitten by ticks. Another factor for consideration is the density of vector ticks in the environment. This vector-tick density also varies with geographic location. Vector ticks are present in most of the

states throughout the U.S. There are, however, some areas that are more highly populated with infected ticks (as discussed earlier), and thus individuals in these locations would be at greater risk. Finally, the prevalence of *B. burgdorferi* infection in the vector ticks must be considered. All of these conditions are important considerations in determining an individual's risk of developing Lyme disease (1). Individuals who engage in high-risk leisure activities or occupations, especially during nymphal tick feeding season, in areas heavily infested with ticks carrying *B. burgdorferi* are at greatest risk of infection.

Prevention

Contact Avoidance

Avoiding tick bites is of utmost importance in the prevention of Lyme disease and other tick-borne illnesses. The CDC discusses several strategies to prevent tick-human contact:

- Avoiding brushy, overgrown grassy, and wooded habitats, particularly in spring and early summer when nymphal ticks feed;
- Removing leaves, tall grass, and brush from areas surrounding work areas or residential areas, thereby reducing tick, deer, and rodent habitat;
- Applying tick-toxic chemicals (e.g., Damminix, Dursban, Sevin, etc.) to surrounding work or residential areas has resulted in suppression of the tick population.

Pesticides should be used only in accordance with federal Environmental Protection Agency (EPA) and applicable state and local regulations. Their application may be controversial or considered inappropriate in some communities. Some concerns regarding widespread use, including long-term effects on water supply and wildlife, have been raised. Investigation into various environmental aspects of these measures continues.

Although tick habitat should be avoided or cleared where possible, there are some job duties where this is not possible. The probability of tick bites can be decreased by using personal protection. Several measures have been recommended for personal protection, and have been used, including (1,6):

- Wearing light-colored clothing so that ticks can be more easily seen and removed before attachment occurs;
- Wearing long-sleeved shirts and tucking pant legs into socks or boots to prevent ticks from reaching the skin;
- Wearing high boots or closed shoes that cover the entire foot;
- Wearing a hat;
- Spraying insect repellents (containing n,n-diethylm-toluamide [DEET]) on exposed skin, excluding the face, in accordance with EPA guidelines. Using permethrin on clothes to kill ticks on contact;
- Showering, and washing and drying clothes at a high temperature, after outdoor exposure;
- Checking the body carefully for ticks; once found, promptly removing them with tweezers. (Grasp the tick firmly and as close to the skin as possible. With a steady motion, pull the tick's body away from the skin. Cleanse the area with an antiseptic. DO NOT use petroleum jelly, a hot match, nail polish, or other products to remove the tick.)

Although extensive statistical analyses of the effectiveness of these protective measures have not been accomplished, these practices are recommended by public health experts, and they are used by tick research personnel and others with unavoidable exposure to ticks. Studies have examined some of these measures and have indicated that some of them are effective (6).

Conclusions

The incidence and prevalence of occupationally acquired Lyme disease has not been precisely defined; several studies have addressed this issue and have indicated that outdoor workers in areas where the disease is endemic are at increased risk.

The risk of encountering ticks infected with *B. burgdorferi* varies from state to state, within states, and even within counties. Current information regarding risk in specific areas is best obtained from state and local public health authorities.

Preventing tick bites is of utmost importance in preventing Lyme disease and other tickborne illnesses. Tick bite prevention strategies include avoidance or clearing of tick-infested habitats and use of personal protective measures (e.g., repellents and protective clothing). Tick checks should be done regularly, and ticks should be removed promptly.

If an individual engaged in outdoor work in heavily wooded or brushy areas develops flu-like symptoms (fever, chills, muscle aches, joint pains, neck stiffness, headache) or a bulls-eye rash, the worker should seek medical attention even if there is no recall of a tick bite (1). A person, including an outdoor worker, who has experienced a tick bite in a high endemic area for Lyme disease should remove the tick and seek medical attention if signs and/or symptoms of

tick-borne diseases occur. Medical evaluation following a tick bite in a high-endemic area for Lyme disease or other tickborne illness may help to alleviate concerns and establish a baseline for follow-up of the bitten individual should signs and symptoms develop.

Most cases of early Lyme disease can be successfully treated with commonly available antibiotics; therefore, early diagnosis and initiation of therapy are important to ensure the best treatment outcome possible.

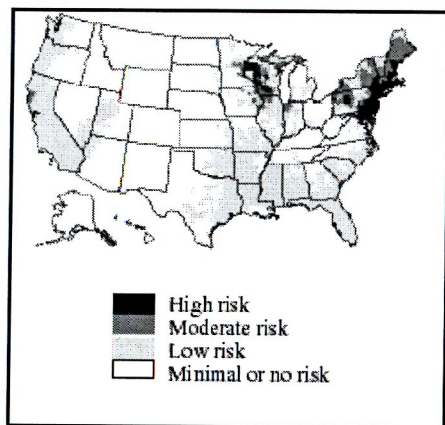
Information Availability

Investigation continues into various aspects of Lyme disease, including more precise definition of occupational transmission, and relative effectiveness of the various recommended preventive measures. Meanwhile, workers and employers need to be aware of the present state of knowledge regarding Lyme disease and methods of protection. Workers should be advised of the signs and symptoms of Lyme disease, as well as the primary and secondary preventive measures for decreasing the risk of Lyme disease transmission, acute illness, and chronic health effects.

OSHA field staff and consultation personnel should be aware of the potential for Lyme disease transmission to outdoor workers in areas endemic for *B. burgdorferi* infected ticks.

Please distribute copies of this bulletin to Area Offices, State Plan States, and Consultation Projects.


National Lyme disease risk map with four categories of risk



Note: This map demonstrates an approximate distribution of predicted Lyme disease risk in the United States. The true relative risk in any given county compared with other counties might differ from that shown here and might change from year to year. Risk categories are defined in the text. Information on risk distribution within states and counties is best obtained from state and local public health authorities. See reference 3 for details on risk definition.

References

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